

FCC TEST REPORT

Test report
On Behalf of
Shenzhen Simtoo Intelligent Technology Co., LTD.
For
Dragonfly Drone
Model No.: DF-400, DF-XXX(XXX--Color of product,
batch of Product, version of product)
FCC ID: 2AG45-DF400

Prepared for : **Shenzhen Simtoo Intelligent Technology Co., LTD.**
West Industry Building A5, Park Road, Bao'an District,
Shenzhen, China

Prepared By : **WST Certification & Testing (HK) Limited**
12/F., San Toi Building,137-139 Connaught Road Central,Hong Kong

Date of Test: **Dec. 18, 2015 ~ Dec. 24, 2015**
Date of Report: **Dec. 25, 2015**
Report Number: **WST151208124**

TEST RESULT CERTIFICATION

Applicant's name: Shenzhen Simtoo Intelligent Technology Co., LTD.
Address: West Industry Building A5, Park Road, Bao'an District,
Shenzhen, China

Manufacture's Name: Shenzhen Simtoo Intelligent Technology Co., LTD
Address: West Industry Building A5, Park Road, Bao'an District,
Shenzhen, China

Product description

Trade Mark: SIMTOO

Product name: Dragonfly Drone

Model and/or type reference : DF-400, DF-XXX(XXX--Color of product, batch of Product, version
of product)

Standards: FCC Rules and Regulations Part 15 Subpart C Section 15.249
ANSI C63.10: 2013

This publication may be reproduced in whole or in part for non-commercial purposes as long as the WST Certification & Testing (HK) Limited is acknowledged as copyright owner and source of the material. WST Certification & Testing (HK) Limited takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Date of Test :

Date (s) of performance of tests : Dec. 18, 2015 ~ Dec. 24, 2015

Date of Issue : Dec. 25, 2015

Test Result : Pass

Testing Engineer :



(Eric Xie)

Technical Manager :



(Dora Qin)

Authorized Signatory :



(Kait Chen)

Table of Contents	Page
1 . TEST SUMMARY	4
2 . GENERAL INFORMATION	5
2.1 General Description of EUT	5
Operation of EUT during testing	6
2.2 Description of Test Setup	6
2.3 MEASUREMENT INSTRUMENTS LIST	7
3 . CONDUCTED EMISSIONS TEST	9
3.1 Conducted Power Line Emission Limit	9
3.2 Test Setup	9
3.3 Test Procedure	9
3.4 Test Result	9
4 RADIATED EMISSION TEST	10
4.1 Radiation Limit	10
4.2 Test Setup	10
4.3 Test Procedure	11
4.4 Test Result	11
5 OCCUPIED BANDWIDTH MEASUREMENT	19
5.1 Test Setup	19
5.2 Test Procedure	19
5.3 Measurement Equipment Used	19
5.4 Test Result	19
6 ANTENNA REQUIREMENT	20
7 PHOTOGRAPH OF TEST	21

1. TEST SUMMARY

1.1 Test Procedures And Results

DESCRIPTION OF TEST	RESULT
CONDUCTED EMISSIONS TEST	COMPLIANT
RADIATED EMISSION TEST	COMPLIANT
BAND EDGE	COMPLIANT
OCCUPIED BANDWIDTH MEASUREMENT	COMPLIANT
ANTENNA REQUIREMENT	COMPLIANT

1.2 Test Facility

Test Firm : Shenzhen WST Testing Technology Co., Ltd.
Certificated by FCC, Registration No.: 939433
Address : 1F,No.9 Building,TGK Science & Technology Park,Yangtian Rd.,
NO.72 Bao'an Dist., Shenzhen,Guangdong,China. 518101
Tel : (86)755-33916437
Fax : (86)755-27822175

1.3 Measurement Uncertainty

Measurement Uncertainty	
Conducted Emission Expanded Uncertainty	= 2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	= 3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	= 4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	= 4.06dB, k=2

2. GENERAL INFORMATION

2.1 General Description of EUT

Equipment	Dragonfly Drone
Model Name	DF-400, DF-XXX(XXX--Color of product, batch of Product, version of product)
FCC ID	2AG45-DF400
Model Difference	All the model are the same circuit and RF module,except the appearance colour, this report only test mode name: DF-400.
Antenna Type	Internal Antenna
Antenna gain	2dBi
Operation frequency	915MHz
Number of Channels	1CH
Modulation Type	FSK
Power Source	DC voltage
Power Rating	DC 11.1V
Adapter Model	/

2.1.1 Carrier Frequency of Channels

Channel	Frequency(MHz)
01	915

Operation of EUT during testing

Operating Mode

The mode is used: Transmitting mode

CH: 915MHz

2.2 Description of Test Setup



2.3 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Receiver	Rohde & Schwarz	ESCI	100627	May 19, 2015	1 Year
2.	LISN	SchwarzBeck	NSLK 8126	8126377	May 19, 2015	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	May 19, 2015	1 Year
4.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
5.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	May 19, 2015	1 Year
6.	Trilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 17, 2015	1 Year
7.	Pre-amplifier	Compliance Direction	PAP-0203	22008	May 19, 2015	1 Year
8.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
9.	EMI Receiver	Rohde & Schwarz	ESCI	100627	May 19, 2015	1 Year
10.	LISN	SchwarzBeck	NSLK 8126	8126377	May 19, 2015	1 Year
11.	RF Switching Unit	Compliance Direction	RSU-M2	38303	May 19, 2015	1 Year
12.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
13.	EMI Receiver	Rohde & Schwarz	ESCI	100627	May 19, 2015	1 Year
14.	EMI Receiver	Rohde & Schwarz	ESCI	100627	May 19, 2015	1 Year
15.	LISN	SchwarzBeck	NSLK 8126	8126377	May 19, 2015	1 Year
16.	RF Switching Unit	Compliance Direction	RSU-M2	38303	May 19, 2015	1 Year
17.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
18.	Programmable AC Power source	SOPH POWER	PAG-1050	630250	May 26, 2015	1 Year
19.	Harmonic and Flicker Analyzer	LAPLACE	AC2000A	272629	May 26, 2015	1 Year
20.	Harmonic and Flicker Test Software AC 2000A	LAPLACE	N/A	N/A	N/A	N/A
21.	ESD Simulators	KIKUSUI	KES4021	LJ003477	May 25, 2015	1 Year
22.	EFT Generator	EMPEK	EFT-4040B	0430928N	May 19, 2015	1 Year
23.	Shielding Room	ChangZhou ZhongYu	JB88	SEL0166	May 19, 2015	1 Year
24.	Signal Generator 9KHz~2.2GHz	R&S	SML02	SEL0143	May 19, 2015	1 Year
25.	Signal Generator 9KHz~1.1GHz	R&S	SML01	SEL0135	May 19, 2015	1 Year
26.	Power Meter	R&S	NRVS	SEL0144	May 19, 2015	1 Year
27.	RF Level Meter		URV35	SEL0137	May 19, 2015	1 Year
28.	Audio Analyzer	R&S	UPL	SEL0136	May 19, 2015	1 Year
29.	RF-Amplifier 150KHz~150MHz	BONN Elektronik	BSA1515-25	SEL0157	May 19, 2015	1 Year

30.	Stripline Test Cell	Erika Fiedler	VDE0872	SEL0167	N/A	N/A
31.	TV Test Transmitter	R&S	SFM	SEL0159	May 17, 2015	1 Year
32.	TV Generator PAL	R&S	SGPF	SEL0138	May 19, 2015	1 Year
33.	TV Generator Ntsc	R&S	SGMF	SEL0140	May 19, 2015	1 Year
34.	TV Generator Secam	R&S	SGSF	SEL0139	May 19, 2015	1 Year
35.	TV Test Transmitter 0.3MHz~3300MHz	R&S	SFQ	SEL0142	May 19, 2015	1 Year
36.	MPEG2 Measurement Generator	R&S	DVG	SEL0141	May 19, 2015	1 Year
37.	Spectrum Analyzer	R&S	FSP	SEL0177	May 19, 2015	1 Year
38.	Matching	R&S	RAM	SEL0146	N/A	N/A
39.	Matching	R&S	RAM	SEL0148	N/A	N/A
40.	Absorbing Clamp	R&S	MDS21	SEL0158	May 17, 2015	1 Year
41.	Coupling Set	Erika Fiedler	Rco, Rci, MC, AC, LC	SEL0149	N/A	N/A
42.	Filters	Erika Fiedler	Sr, LBS	SEL0150	N/A	N/A
43.	Matching Network	Erika Fiedler	MN, T1	SEL0151	N/A	N/A
44.	Fully Anechoic Room	ChangZhou ZhongYu	854	SEL0169	Jun. 10, 2015	1 Year
45.	Signal Generator	R&S	SML03	SEL0068	May 17, 2015	1 Year
46.	RF-Amplifier 30M~1GHz	Amplifier Reasearch	250W1000A	SEL0066	Oct. 24, 2015	1 Year
47.	RF-Amplifier 0.8~3.0GHz	Amplifier Reasearch	60S1G3	SEL0065	Oct. 24, 2015	1 Year
48.	Power Meter	R&S	NRVD	SEL0069	May 17, 2015	1 Year
49.	Power Sensor	R&S	URV5-Z2	SEL0071	May 17, 2015	1 Year
50.	Power Sensor	R&S	URV5-Z2	SEL0072	May 17, 2015	1 Year
51.	Software EMC32	R&S	EMC32-S	SEL0082	N/A	N/A
52.	Log-periodic Antenna	Amplifier Reasearch	AT1080	SEL0073	N/A	N/A
53.	Antenna Tripod	Amplifier Reasearch	TP1000A	SEL0074	N/A	N/A
54.	High Gain Horn Antenna(0.8-5G Hz)	Amplifier Reasearch	AT4002A	SEL0075	N/A	N/A
55.	Active loop antenna	Amplifier Reasearch	FMZB1519	12987	May 17, 2015	1 Year
56.	Horn Antenna	Sunol sciences corp.	DRH-118	A062013	May 17, 2015	1 Year
57.	Horn Antenna	Sunol sciences corp.	BBHA9170	1562	May 17, 2015	1 Year

3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

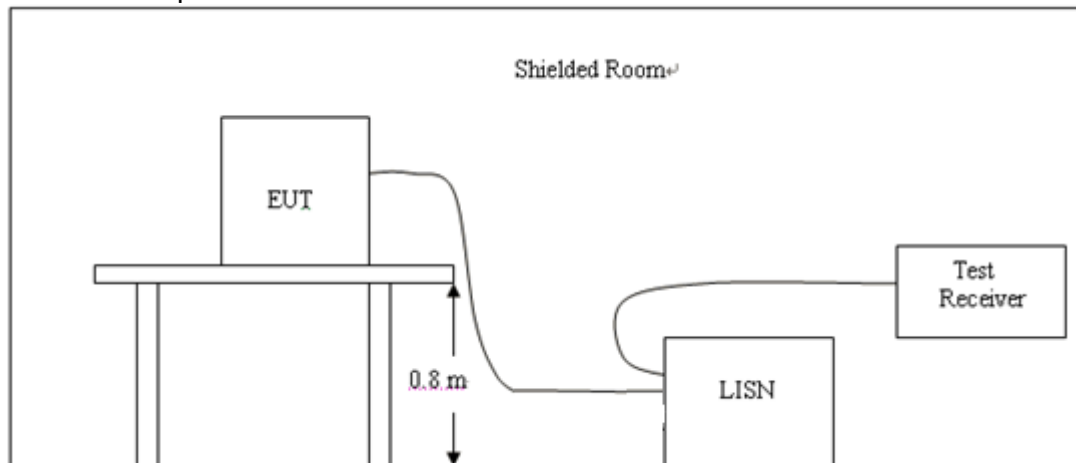
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

3.2 Test Setup



3.3 Test Procedure

- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipments received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

3.4 Test Result

N/A (The EUT shall not apply to the Power line conducted Emission Test).

4 RADIATED EMISSION TEST

4.1 Radiation Limit

For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB μ V/m)	Radiated (μ V/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

LIMITS OF RADIATED EMISSION MEASUREMENT (FCC Part 15.249)

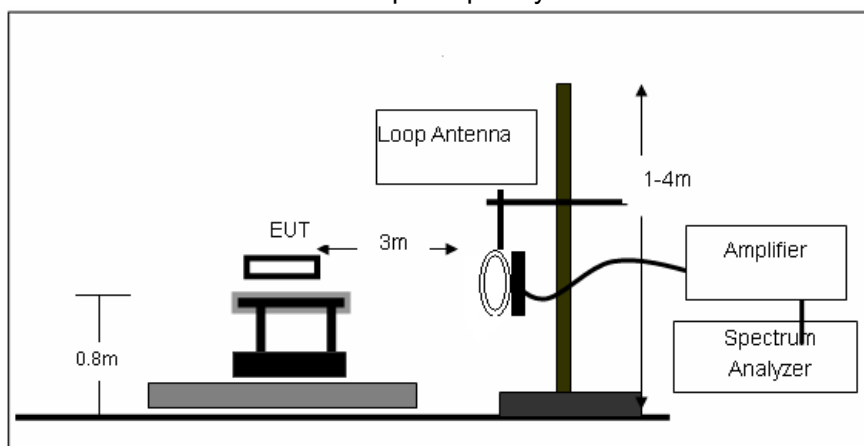
Frequency of Emission (MHz)	Field Strength of fundamental ((millivolts /meter)	Field Strength of Harmonics (microvolts/meter)
902-928	50	500

Notes:

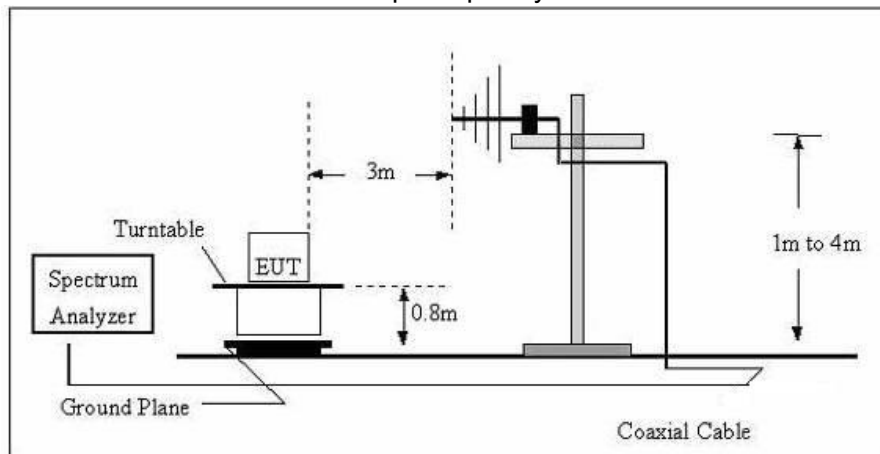
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

4.2 Test Setup

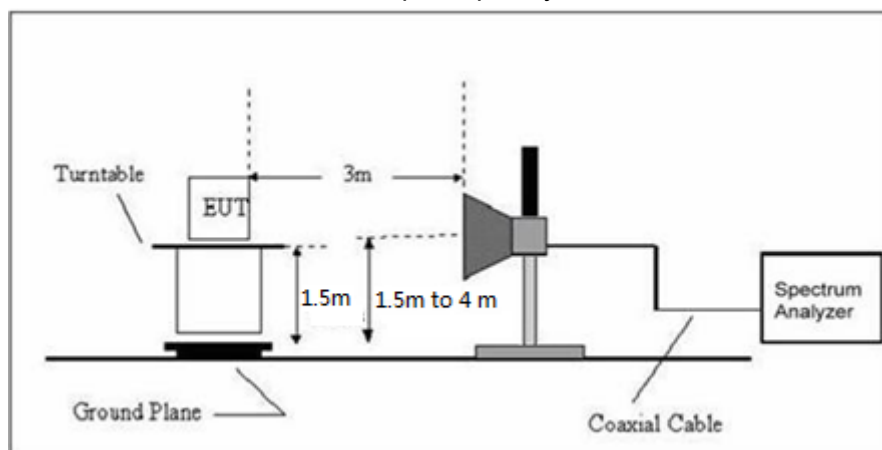
(1) Radiated Emission Test-Up Frequency Below 30MHz



(2) Radiated Emission Test-Up Frequency 30MHz~1GHz



(3) Radiated Emission Test-Up Frequency Above 1GHz



4.3 Test Procedure

1. The EUT is placed on a turn table, which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. Based on the Frequency Generator in the device include 26MHz. The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).

Note:

Three axes are chosen for pretest, the Y axis is the worst mode for final test.

For battery operated equipment, the equipment tests shall be performed using a new battery.

4.4 Test Result

PASS

TX Mode:

Blow 30MHz Test Results:

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported

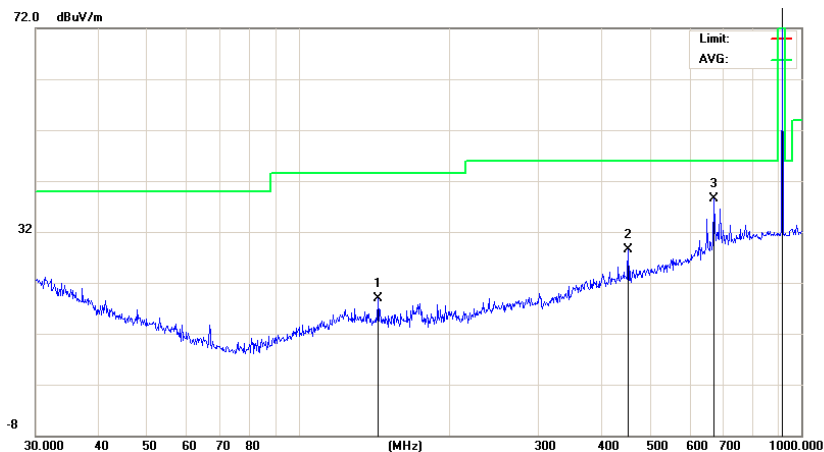
Distance extrapolation factor = $20 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

TX Mode:

30MHz-1GHz Test Results:

Horizontal

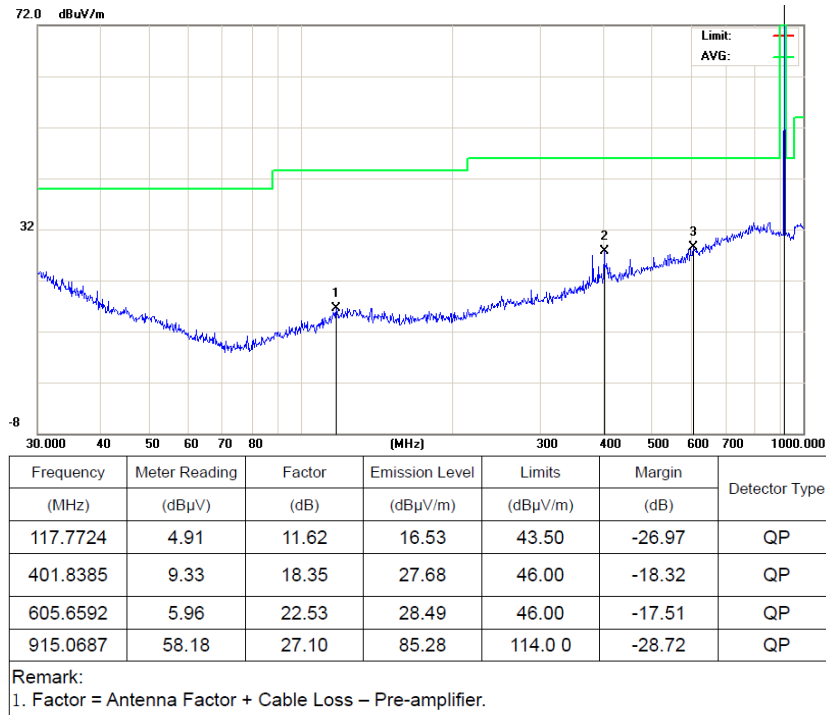


Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
143.8293	7.96	11.03	18.99	43.50	-24.51	QP
452.7196	9.19	19.36	28.55	46.00	-17.45	QP
670.4891	14.58	23.98	38.56	46.00	-7.44	QP
915.0687	53.22	27.10	80.32	114.0 0	-33.68	QP

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

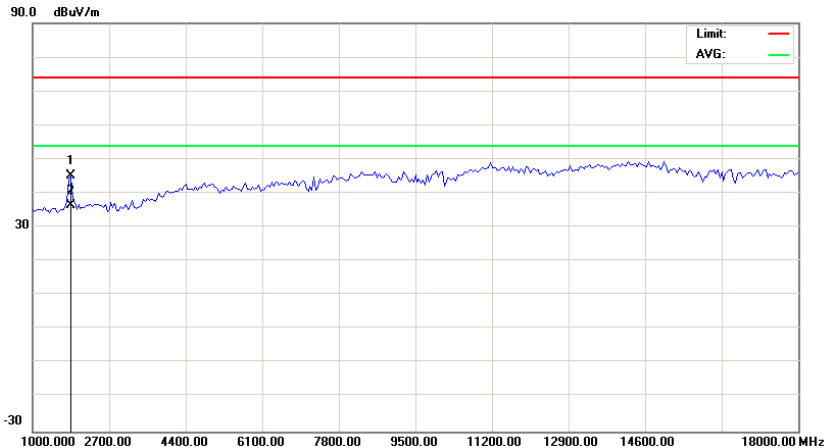
Vertical



Remark:

- (1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
- (2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

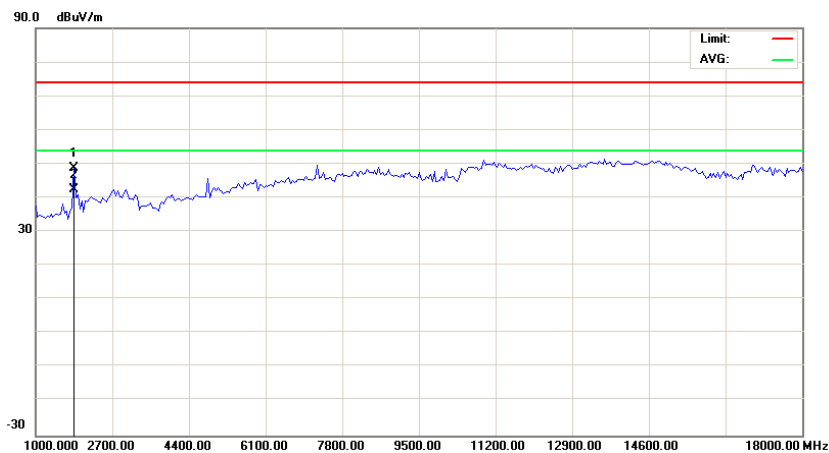
TX Mode:
Above 1 GHz Test Results:
Horizontal



Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
1850.000	59.66	-14.64	45.02	74.00	-28.98	peak
1850.000	51.23	-14.64	36.59	54.00	-17.41	AVG

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission above 18GHz.

Vertical



Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
1850.000	63.48	-14.64	48.84	74.00	-25.16	peak
1850.000	57.16	-14.64	42.52	54.00	-11.48	AVG

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission above 18GHz.

RX Mode:

Blow 30MHz Test Results:

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported

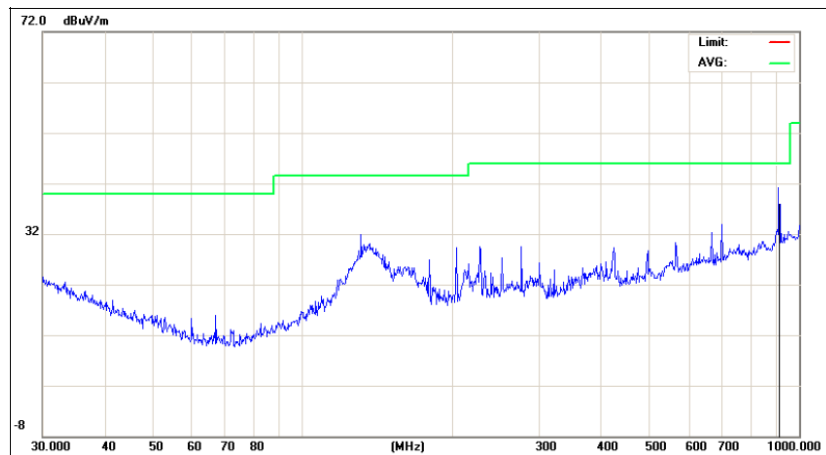
Distance extrapolation factor = $20 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

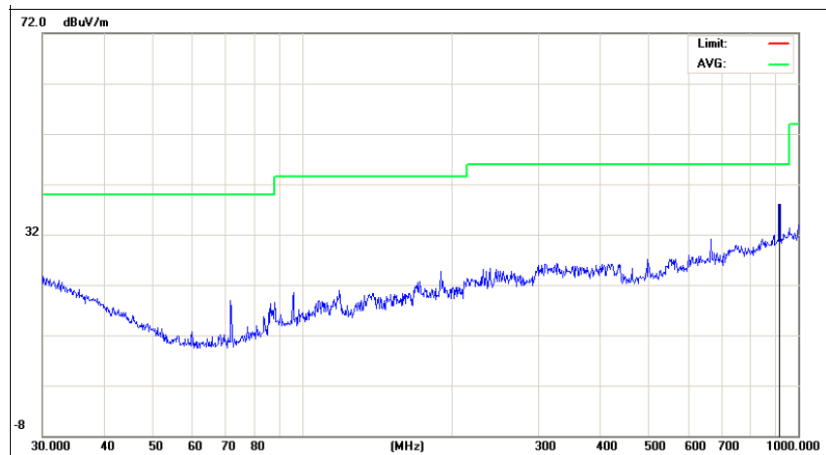
RX Mode:

30MHz-1GHz Test Results:

Horizontal:



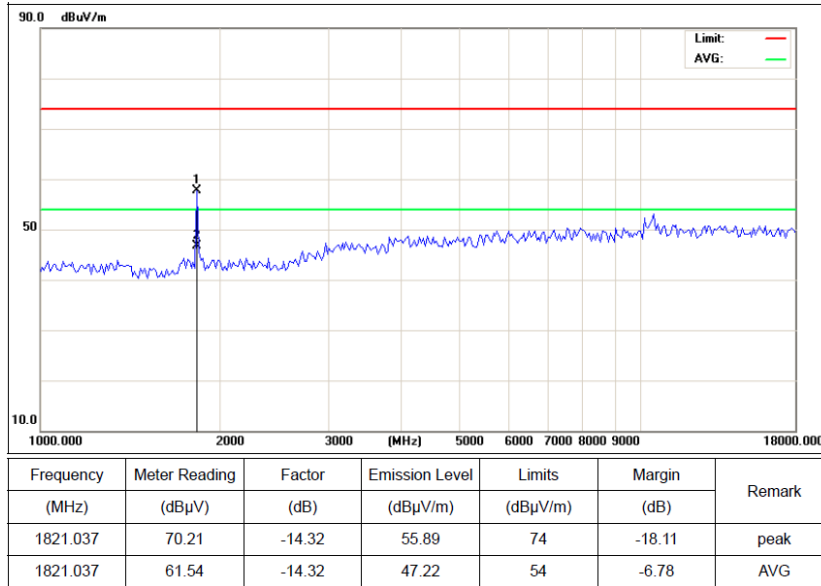
Vertical:



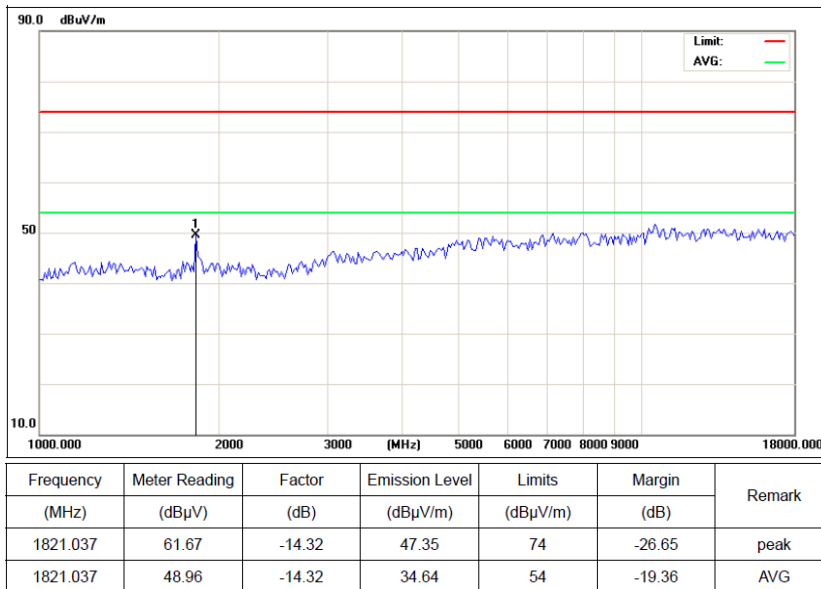
Remark:

- (1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
- (2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

RX Mode:
Above 1 GHz Test Results:
Horizontal

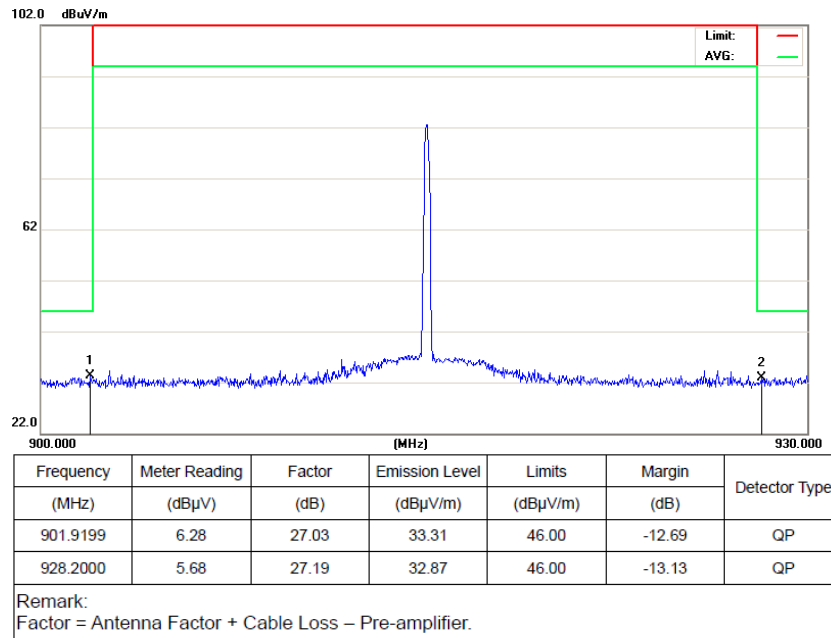


Vertical

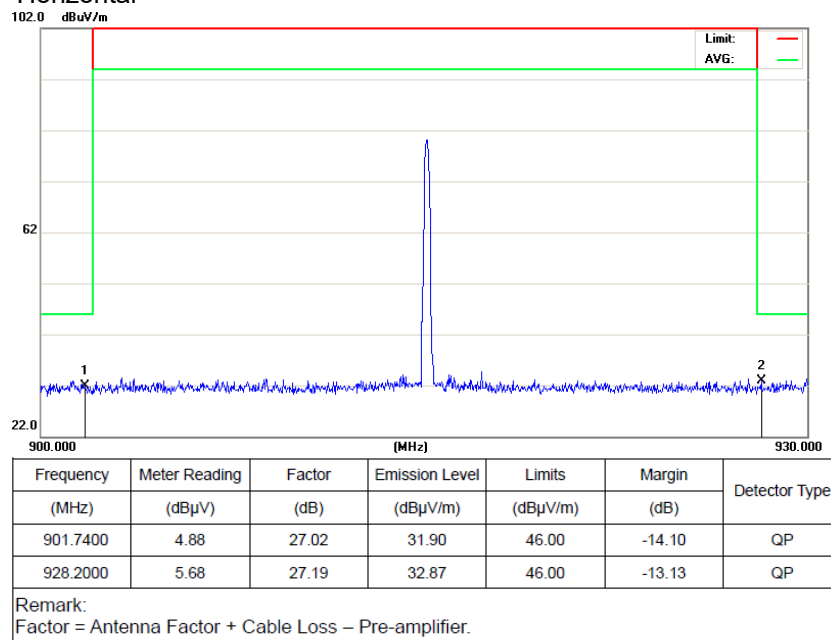


TX Mode Restricted bands requirements

Vertical



Horizontal



5 OCCUPIED BANDWIDTH MEASUREMENT

5.1 Test Setup

Same as Radiated Emission Measurement

5.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Based on FCC Part15 C Section 15.239(a): RBW= 10KHz. VBW= 30 KHz, Span=1MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector.

5.3 Measurement Equipment Used

Same as Radiated Emission Measurement

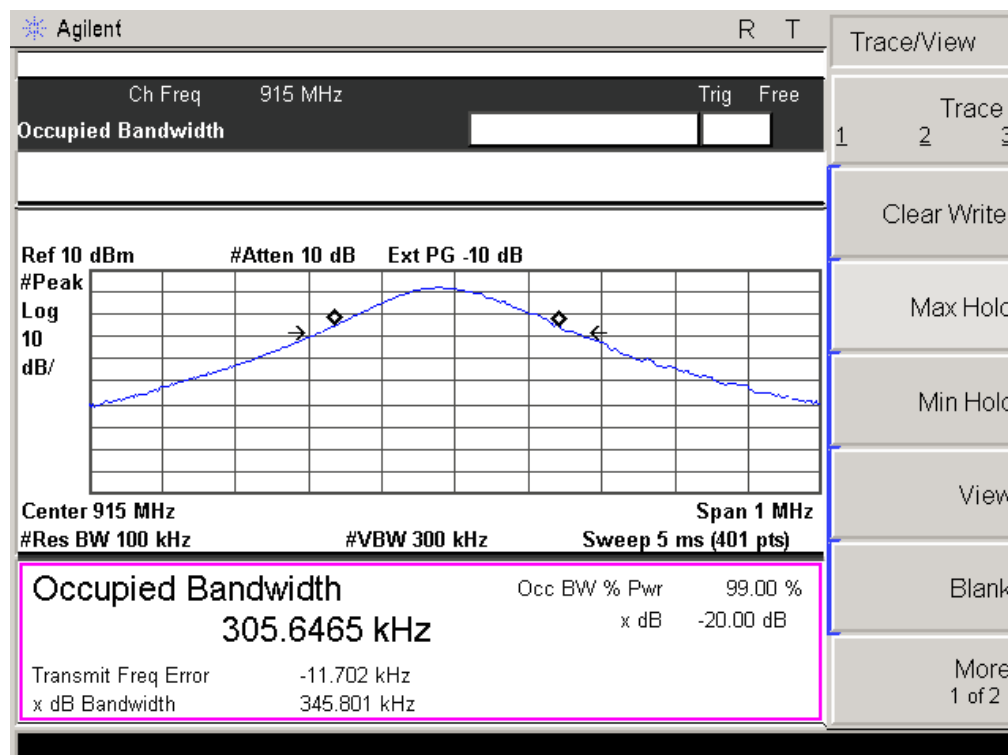
5.4 Test Result

PASS

Channel Frequency (MHz)	20Db Bandwidth(MHz)
CH01 (915MHz)	0.346

TX Mode

CH01 (915MHz)



6 ANTENNA REQUIREMENT

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.249, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

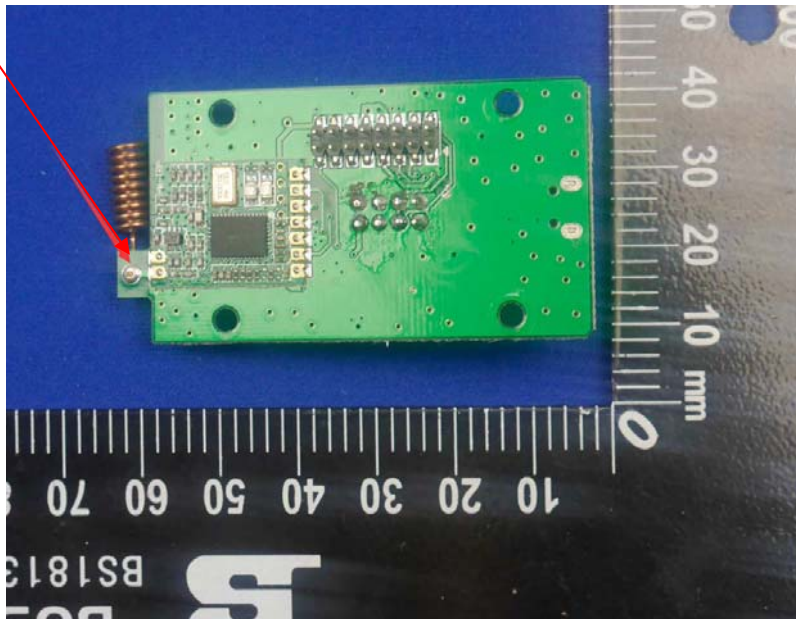
Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The antenna used in this product is a Internal Antenna, The directional gains of antenna used for transmitting is 2dBi.

ANTENNA



7 PHOTOGRAPH OF TEST

7.1 Radiated Emission

